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ordinary trip it hardly pays. It adds too much unnecessary weight, while a good botanist will probably recognize all the plants he encounters even if there be some new to him.

When it is desirable to take a luncheon along and not convenient to carrry it in the small box, it is better to provide a small *haversack* made of light enamelled cloth and carried on the back. It weighs only 2 or 3 ounces, comes handy for various purposes, and is preferable to adding an extra compartment to box, as this addition, I have found, adds more in weight than utility.

A good, stout, easy-fitting pair of *boots* or *shoes*, should be worn on a long tramp. They should have thick, broad soles, broader than the foot, and low, wide heels, for easy walking. English walking shoes are excellent for fields and mountain climbing, but as many of our rarest plants are to be found in swamps, marshes and low, wet grounds, boots, perhaps, on the whole, are preferable to shoes for botanizing,—unless one is willing to follow the example of an enthusiastic botanical friend, who, in traversing some deep, miry swamps, in company with the writer, would deliberately pull off his shoes as he came to each swamp, and explore the batrachian wilderness barefooted.

Rubber boots, except for a limited period in marshes or swamps, should not be worn. They soon become unendurable to wearer, and early put him *hors de combat.*

Light, loose-fitting clothes will be found most comfortable. For a trip of several days or longer, flannel shirts are to be recommended, —blue or gray is preferable. For alpine botanizing, where the air is often exceedingly chilly, a warmer dress is necessary.

Finally, ere concluding these notes on the *outfit*, let the young collector be cautioned against carrying too heavy a burden on setting out on an expedition. It is a temptation into which young botanists are inclined to fall. In the morning in his freshness and vigor, the load will probably not seem over heavy, but after some hours tramping through tangled swamps, sinking morasses, and over dipping bogs, its oppressive weight will be painfully recognized.

Rather than carry a very heavy box all day, it is better to bring in the surplus specimens wrapped in Osmundas, and the bundle tied with grasses. I have frequently done this,—the bundle being slightly moistened, the most delicate plants can be kept as fresh as in box.

§ 235. **Publications.**—1. *Synoptical Flora of North America.* When thirty-five years ago Torrey & Gray's Flora of North America had been brought down to the end of Compositae, the rapid extension of our territories and exploring surveys, brought such an acccumulation of new material, that these eminent botanists suspended their work on the Flora, and, with others, devoted themselves to working up the new species and correcting the old determinations with the light afforded by the more abundant and complete specimens. This work has at length been accomplished. New species and new genera will no doubt continue to be added, but the great features of our Flora are determined. In the interim Dr. Torrey has departed, leaving a name that will ever be revered as that of one who first laid broad and deep the foundations of American botany. But Dr. Gray, his pupil, survives, with matured wisdom and erudition, and it is a subject of great congratulation that we find him, still in the vigor of his powers, resuming the task apparently so long suspended. As the harvest is about ripe, we may hope that the gathering will take a comparatively short time. The whole work it is calculated will be contained in two volumes of about 1200 pages each. The first volume will "cover the ground which was gone over in the work referred to (now wholly out of print as well as antiquated)." The present issue, Part I. of Vol. II., begins where that stopped and comprises the remainder of the Gamopetalæ. Part II. of Vol. II. will be devoted to the Apetalæ and Gymnospermae, "and the final portion to the Monocotyledones and the Vascular Cryptogamia. "Compactness being essential, only the leading synomy and most important references are given, and these briefly." The descriptions are in English, and the arrangement and typography admirable for the purpose of investigation. The fuller synonomy and bibliography will be found in Mr. Watson's Index, which is expected to proceed pari passu with this Flora. The territory covered is the United States and all the North American continent and islands northward, Greenland excluded. The order followed is that of Bentham and Hooker, whose Genera, as far as published, end with Plantaginaceae, as does the work before us. Dr. Gray, however, separates Lobeliaceae from Campanulaceae, and, on the other hand, comprises the Vaccineae and Monotropeae under Ericaceae, immediately after which he places Lennoaceae, (Torrey's Ammobroma and its allies,) and not with B. & H. after Diapensiaceae. Dr. Engelmann supplies the genus Cuscuta. We find Solanum Fendleri, of New Mexico and south, now recognized as Solanum tuberosum, L., *var.* boreale, so that we can now say that the potato is a native of the United States. There are described in this Part of the Flora 1663 species, belonging to 321 genera and 32 orders. The corresponding orders in Bentham & Hooker have about 1340 genera and 18,800 species. This gives, for the World, an average of about 42 genera for one of these orders, and 14 species for a genus; for North America about 10⅓ genera for an order, and 5⅕ species for a genus. Thus we have about 24 per cent. of all the genera and 9 per cent of the species, showing a still greater preponderance of genera over species than in the case of the Polypetalae which we pointed out in the notice of Mr. Watson's Index. Dr. C. W. Short, of Columbia College, in speaking of Dr. Torrey's genial influence, once remarked that his greatest contribution to science was his pupil, Dr. Gray. New York botanists may well take pride in claiming these eminent men as compatriots. The publisher's price for this part is $6. Ivison, Blakeman, Taylor & Co., New York. It may also be obtained from the Curator of Harvard University Herbarium, Cambridge.

2. Papers from the Transactions of the Academy of Science, St. Louis, Vol. III., No. 4, by Dr. George Engelmann: *The Flowering of Agave Shawii.* The phenomena presented by a fine specimen in Mr. Shaw's greenhouse are here described and illustrated by this

accurate observer. The flower stalk began to rise early in July. After September 5th, (when it had reached a height of about 47 inches) the growth diminished rapidly; about the end of the month the head began to swell, three months later the first blossoms opened, and the flowering season occupied from six to seven weeks. The first flowers opened on the lowest branch, the innermost ones of each cluster first. On the second day the anthers are shrivelled though quantities of pollen remain adhering to them even to the fifth day [in the green house] when the style has reached its full development, more than an inch higher than the stamens. The stigmatic fluid remains fresh the second and even the third day. While the flowers were open the whole tube was filled to the brim with a sweetish watery liquid. Mr. Greene found a similar phenomenon in Agave Parryi, in New Mexico. Dr. Englemann invites attention to this secretion in other cases, as A. Virginica exudes only a small quantity of honey in the base of the tube.—*The American Junipers of the Section Sabina.—A Synopsis of the American Firs, (Abies, Link,) i. e.*, Balsams not Spruces. Dr. Engelmann remarks: "It is a most interesting as well as significant fact that while the anatomical structure of the leaves of higher organized plants shows considerable uniformity, so that it rarely can be made available for diagnostic purposes, the conifers exhibit such a wonderful variety of leaf structure (approaching thereby the lowest orders of vascular plants), that often a single leaf is sufficient to recognize the genus, and often the species, even when the ordinary characters may leave us in doubt." In the case of the Junipers "the edges of the leaf are rarely entire, mostly delicately denticulate, or irregularly fringed with minute corneous often curved processes." The figures given represent the margin of the leaf when magnified 280 times, but a much lower power will enable the student to recognize its character. Of our species, J. Californica, Carrière (J. tetragona, *var.* osteosperma, Torr.), has the fringe most marked, J. Virginiana, L., the least or almost straight. Of the nine species of Sabinae enumerated, three, J. Mexicana, flaccida, tetragona, are confined to the highlands of Mexico; J. Bermudiana to the West Indies. J. Californica is peculiar to the coast ranges and islands of California; J. pachyphloea, Torr., (with thick bark) to the interior of Arizona and New Mexico. J. occidentalis, Hook., is characteristic of the whole western mountain region from West Texas to California and Oregon, some, having a diameter near their base of three feet, must be upwards of a thousand years old. J. Sabina, L., *var.* procumbens, Pursh, does not come south of Maine and shores of the great Lakes. J. Virginiana, L., is singular in its wide distribution; it is not found, however, in California and perhaps Oregon. J. communis, L., whose leaves are wholly acicular, does not belong to this section. As the propriety of calling the flowers of Juniperus, at least the staminate heads, lateral has been questioned in the Club, we were curious to see what Dr. Engelmann has to say on the subject. He is rather obscure: "The male FLOWERS (*vulgo* aments) and female aments have, like the peduncles, and in continuation of them, binate or ternate scales; the edge of the anther-scales corresponds in its character to the margin of the leaves of the same species." With regard to the Firs, the anatomical points of most importance are; the resin ducts of which there are always two in the Abies leaf, readily seen in a horizontal section; the presence or absence of stomata on the upper surface; and the presence, distribution and relative size of the hypoderm cells—robust longitudinal cells, with thick walls and a very slender cavity, almost always present on the edges and keel of the leaf and often forming a stratum on the upper side. These cells seem to form the most certain distinction between A. Fraseri, Pursh, of the high mountains of North Carolina, our A. balsamea, Marshal, and A. subalpina, Engelmann; the first having an almost uninterrupted stratum of hypodermic cells on the upper side of the leaf; the second scarcely any; and the third, which is the western representative of *balsamea*, more abundant cells above than under it, and crowded on edges and keel. The next four species have the resin ducts close to the epidermis of the lower side, towards the edges. A. grandis, Douglas, and A. concolor, Engelmann have the hypoderm cells in interrupted strata under the upper surface of the leaf; A. religiosa, H. B. K., and A. bracteata, Don, in a continuous layer. A. grandis has no stomata above, A. concolor has. A. bracteata has glabrous scales, and may thus be distinguished from the Mexican A. religosa and all other firs. The 8th and 9th species have the resin ducts, like the last four, close to the epidermis of the lower side, and in fertile branches equidistant from the edges and keel, but it is questioned whether 8, A. nobilis, Douglas, and 9. A. magnifca, Murray, are really distinct; Dr. Engelmann, inclines to think they are; Drs. Hooker and Gray, that they are not. In giving this diagnosis we have omitted all the other distinctions of more service in determining the trees when met with, as we wished to give an idea of these crucial anatomical points in the case of doubtful specimens, and we have not perhaps done justice even to these. After all it is very difficult to tie nature down to logical exactness. We see in Nature, Ap. 18th, that Mr. J. Gorham, in a paper read before the Linnean Society undertakes to detect the genus of an umbelliferous plant from an examination of the venation of the merest fragment. We wish we had room to extract some more graphic parts of the description of these noble trees.

§ 236. **Opuntia Ficus-Indica, DC.**—I have received from Dr. C. H. F. Peters, of the Hamilton College Observatory, the following note, commenting on my note in the BULLETIN lately. He was "reminded of the hedges in Sicily and of the impenetrable cactus fields on the lavas of Mt. Etna. It is the plant first of all used to break down the lava beds. A handful of soil is put down, and a cactus joint (or leaf) thrown upon it. That soon takes root, and the rock weathers very fast. So that, after a few years, as the second plant for aiding in making vegetable soil, fig trees are set out. I liked the fruit of the catcus very much."

You may remember that Dr. Peters made the first thorough survey of Mt. Etna, before 1840, at the expense of some German duchy. His survey is quoted in Humboldt's Cosmos. I. H. H.

§ 237. **Rediscovery of a lost Sphaeria.**—On returning from a